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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/040,173	10/23/2001	Krishnamurthy Vaidyanathan	US 010520	9007

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EXAMINER	
FAN, CHIEH M	

ART UNIT	PAPER NUMBER
2638	

DATE MAILED: 10/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/040,173	VAIDYANATHAN ET AL.	
	Examiner	Art Unit	
	Chieh M. Fan	2638	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 October 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-49* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5,7,8,11,13-18,22,27-29,32,34-39 and 43-49* is/are rejected.

7)☒ Claim(s) *2-4,6,9,10,12,19-21,23-26,30,31,33 and 40-42* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 5, 7, 11, 13, 27, 28, 32, and 34 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification does not teach how the power of each of the supplement signals is selected to minimize interference with demodulation of the data signal without reference to the one or more supplemental signals. The specification only indicates that the power is 30 dB below the data signal, but does not explain how the power of -30dB would minimize the interference. The specification also never teaches how the minimum interference is determined.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. 35 U.S.C. 101 defines four categories of inventions that Congress deemed to be appropriate subject matter of a patent; namely: processes, machines, manufactures and compositions of matter. Claims 43-49 are directed to a signal, which clearly does not fall into any of the four categories.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 8,14, 29, 35, 43, 48 and 49 are rejected under 35 U.S.C. 102(e) as being anticipated by Emi (U.S. Patent No. 6,148,020).

Regarding claim 8, Emi teaches a transmitter for improved wireless communications comprising: a symbol source producing a data signal (10, 12 in Fig. 3); a waveform generator producing a time-varying signal which changes frequency during each of a plurality of periods, wherein the frequency changes from one period to a subsequent period in a predetermined sequence of frequencies within a channel be

employed in transmitting the data (14, 16 in Fig. 3; also see col. 8, lines 5-10); and a modulator (20 in Fig. 3) producing a transmission signal from combination (18 in Fig. 3) of the data signal and the time-varying signal.

Regarding claim 14, wherein the time-varying signal is one of a plurality of time-varying signals each having a different frequency during a period and each changing frequency from one period to a subsequent period in the predetermined sequence of frequencies (col. 1, line 66 through col. 2, line 5; that is the time varying signal is one of 31 possible signal if there are 31 codes in the code sequences).

Regarding claim 29, Emi teaches a method for improved wireless communications comprising: producing a data signal (10, 12 in Fig. 3); producing a time-varying signal which changes frequency during each of a plurality of periods, wherein the frequency changes from one period to a subsequent period in a predetermined sequence of frequencies within channel to be employed in transmitting the data (14, 16 in Fig. 3; also see col. 8, lines 5-10); and producing a transmission signal from a combination the data signal and the time-varying signal (20, 18 in Fig. 3).

Regarding claim 35, wherein the time-varying signal is one of a plurality of time-varying signals each having different frequency during a period and each changing frequency from one period to a subsequent period in the predetermined sequence frequencies (col. 1, line 66 through col. 2, line 5; that is the time varying signal is one of 31 possible signal if there are 31 codes in the code sequences).

Regarding claim 43, Emi teaches a wireless communication signal comprising: a data signal (10, 12 in Fig. 3); and least one supplemental signal (14, 16 in Fig. 3)

combined with the data signal (18 in Fig. 3), the at least one supplemental signal having a frequency which changes during each of plurality of periods in a predetermined sequence of frequencies for a channel in which the wireless communication signal is transmitted (see col. 8, lines 5-10).

Regarding claim 48, Emi further teaches a plurality of supplemental signals each having a different frequency during a given period and each changing frequencies in the predetermined sequence from one period a subsequent period (col. 1, line 66 through col. 2, line 5; that is the time varying signal is one of 31 possible signal if there are 31 codes in the code sequences).

Regarding claim 49, wherein wireless communications signal is a result of modulating the combination of the data signal and the at least one supplemental signal (20 in Fig. 3).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Birru (U.S. Patent No. 6,912,258) in view of Nilsson (U.S. Patent No. 6,853,689).

Regarding claim 1, Birru teaches a wireless communications system (a DTV system, see col. 1, lines 18-23) comprising: a receiver (101 in Fig. 1) employing the one or more supplemental signals (210 in Fig. 2, col. 6, lines 29-31, i.e., training sequence) to compute a frequency domain channel estimate (212 in Fig. 2) for use in equalizing the channel during demodulation of the data signal.

Since Birru teaches a receiver, Birru inherently teaches a transmitter producing a modulated data signal (i.e., a VSB signal, see col. 1, line 20) and one or more supplemental signals (i.e., training signals). Birru does not particularly teach that the one or more supplemental signals are on various frequencies within the monocarrier (i.e., VSB) channel employed to transmit the modulated data signal.

Nilsson teaches it is necessary to employ several independent pilot frequencies to convey pilot related information to cover the frequency range of the channel (col. 1, lines (col. 1, lines 61-64). Pilot signals may include a series of predetermined symbols. Such predetermined symbols may provide known information which can be used by a receiver to perform channel estimation (col. 1, lines 64-67). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that the supplemental signals of Birru need to be on various frequencies, as taught by Nilsson, so as to provide known information that cover the whole frequency range of channel for the receiver to perform channel estimation.

Claim 22 is a corresponding method claim of claim 1, and is therefore rejected for the same reason.

9. Claims 15-18 and 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laroia et al. (US 2002/0044524, "Laroia" hereinafter) in view of Li (U.S. Patent No. 6,654,429).

Regarding claim 15, Laroia teaches a receiver for improved wireless communications comprising: an equalizer (116 in Fig. 1) performing channel equalization on received signal utilizing a channel estimate (output of 114 in Fig. 1); and a coherent demodulator producing the channel estimate from the received signal and a pilot signal (112, 114 in Fig. 1). Laroia does not particularly teaches that the pilot signal is a time-varying signal corresponding portion of the received signal, wherein the time-varying signal changes frequency during each plurality of periods, wherein frequency changes from one period subsequent period in predetermined sequence frequencies within channel on which the received signal received. However, Li teaches a time-varying pilot signal changes frequency during each plurality of periods, wherein frequency changes from one period subsequent period in predetermined sequence frequencies within channel on which the received signal received (see Fig. 4a, col. 7, lines 6-9 and 19-27) to provide a pilot-aided channel estimation that is robust to both Doppler and multipathing (col. 2, lines 31-34). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate a time-varying pilot signal so as to provide a channel estimation that is robust to both Doppler and multipathing.

Regarding claim 16, Li teaches a waveform generator producing the time varying- signal, wherein a period duration and the predetermined sequence match a

match a corresponding period duration and predetermined sequence employed in generating the received signal (col. 2, lines 34-36).

Regarding claim 17, Li teaches the Waveform generator produces a plurality of time-varying signals (Fig. 4A, note that each block dot corresponds to a pilot signal) each having a different frequency during a period and each changing frequency from one period to a subsequent period in the predetermined sequence of frequencies, wherein the coherent demodulator produces the channel estimate from the received signal and each varying signals (all the pilot signals are used to estimate the channel).

Regarding claim 18, Li teaches that the predetermined sequence spans frequencies within the channel (see Fig. 4A, note the locations of the black dots) to directly provide a frequency domain channel estimate.

Claim 36 is a corresponding method claim of claim 15, and is therefore rejected for the same reason applied to claim 15.

Claim 37 is a corresponding method claim of claim 16, and is therefore rejected for the same reason applied to claim 16.

Claim 38 is a corresponding method claim of claim 17, and is therefore rejected for the same reason applied to claim 17.

Claim 39 is a corresponding method claim of claim 18, and is therefore rejected for the same reason applied to claim 18.

Allowable Subject Matter

10. Claims 2-4, 6, 9, 10, 12, 19-21, 23-26, 30, 31, 33, and 40-42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Myer (U.S. Patent No. 6,411,644) teaches generating pilot signals using frequency hopping. Rafal et al. (U.S. Patent No. 4,618,996) teaches transmitting dual pilot signals.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chieh M. Fan whose telephone number is (571) 272-3042. The examiner can normally be reached on Monday-Friday 8:00AM-5:30PM, Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chieh M Fan
Primary Examiner
Art Unit 2638

September 30, 2005